

SELECTED AGRICULTURAL MECHANICS ABILITIES  
AS RATED BY TEACHERS OF VOCATIONAL AGRICULTURE

by

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A MASTER'S REPORT

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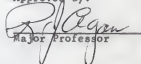
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## INTRODUCTION

The writer of this report had been a teacher of vocational agriculture one and one-half years at the time of the study, had been a student of vocational agriculture for one year in high school, and had enrolled for sixteen hours in the area of agricultural mechanics as a part of the university work leading to the Bachelor of Science degree in agricultural education at Kansas State University.

This experience led the writer of this report to believe that the agricultural mechanics aspect of the total vocational agriculture program had been an important area which was faced with meeting the needs of the student in an ever-changing world. Determining the specific subject material and skills which best meet the needs of the vocational agriculture student in agricultural mechanics has been one of the many responsibilities which faced the teacher of vocational agriculture.

## THE PROBLEM

Based upon the preceding observations and experiences of the writer, this study was undertaken to explore the assumption that if the teacher of vocational agriculture was going to improve his teaching in agricultural mechanics by bringing up-to-date his teaching materials and methods, his own training in the field of agricultural mechanics also

would have to be reviewed and revised as needed. The teachers themselves were considered in this study to be the best source for review and revision to meet the needs for improvement in agricultural mechanics.

Statement of the Problem. In gathering data from the teachers for the purpose of review and possible revision of training programs in agricultural mechanics, there were two main purposes set forth. They were: (1) to survey the opinions of selected vocational agriculture teachers concerning the adequacy of their training in selected agricultural mechanics abilities, and (2) to survey the importance which the selected vocational agriculture teachers had attached to their instruction in selected agricultural mechanics abilities.

Limitations of the Study. The survey part of this study was limited to opinions of vocational agricultural teachers who were teaching vocational agriculture in Kansas at the time of the survey. There was no attempt to survey vocational agriculture teachers in states other than Kansas.

The vocational agriculture teachers included in this study were further limited to those who had completed between one and seven years of teaching and had received their training and Bachelor or Science degree from Kansas State University within the last seven years. The seven-year period from 1960 through 1966 was chosen for this study as

the content of the agricultural mechanics courses at Kansas State University was unaltered during that time.

#### DEFINITIONS OF TERMS USED

For the purpose of understanding the words and terms set forth in this study, certain ones were set aside for special definition. They may or may not have been the same as those of common usage.

Vocational Agriculture Teacher, Instructor, and Graduates. These terms were used synonymously and limited to those persons who graduated from Kansas State University from the years 1960-1966 and were teaching vocational agriculture in Kansas at the time of this study, according to a list provided by C. C. Eustace, State Supervisor of Vocational Agriculture.

Importance of Training. Rating given by the respondents of the survey as "Very important," "Important," or "Not important."

Quality of Training. Rating given by the respondents of the survey as "Good," "Fair," or "Poor."

Respondents. Name given to the forty-five vocational agriculture teachers who were surveyed for the purpose of this report.



## REVIEW OF SELECTED LITERATURE

As a review of related literature was made by the writer of this report, it became quite apparent that many changes have taken place in the area of agriculture and agricultural mechanics. This fact was illustrated by T. L. Faulkner, State Supervisor of Vocational Education in Alabama, when he mentioned that more agricultural change and progress had taken place during the last twenty years than were made during the last two hundred years.<sup>1</sup>

The problem of keeping agricultural education abreast of these changes is not easy. As Dr. Raymond Agan, Head of Agricultural Education at Kansas State University, expressed:

The number one fact to consider in approaching the solution of this problem seems to be that we are working in a situation where the future in subject matter and the future in agricultural opportunities are rapidly growing and largely unknown.<sup>2</sup>

The importance of keeping the agricultural mechanics training up-to-date has been recognized by agricultural educators such as Richard Baker, Teacher Educator at Auburn University, who commented:

In view of the rapid expansion in farm mechanization it is generally agreed among agricultural

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<sup>1</sup>T. L. Faulkner, "Updating Vocational Agriculture to Meet Present and Future Needs," Agricultural Education Magazine, 38:84, October, 1965.

<sup>2</sup>Raymond Agan, "What and How to Teach - a Continuing Problem," Agricultural Education Magazine, 39:5, July, 1966.

educators that the time has arrived for the re-assessment and evaluation of agricultural mechanics instruction.<sup>1</sup>

Teachers of vocational agriculture must look ahead to keep pace with changes in modern agriculture. In recognizing the necessity to cope with change, Dr. L. J. Phipps stated: "Teachers need to keep up-to-date with the latest technical information and methods of teaching."<sup>2</sup>

The review of literature included a study of various Master's theses relating to competencies needed in agricultural mechanics by vocational agriculture teachers.

There were three Master's theses which particularly attracted the interest of the writer of this report as they dealt directly with the competencies the teachers of vocational agriculture need in the area of agricultural mechanics.

The first study was made by Malone<sup>3</sup> in 1961 at West Virginia University. The study conducted by Malone was to determine pre-service training needs in several areas of agricultural mechanics for prospective vocational agriculture teachers, and the relative importance of understandings and

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<sup>1</sup>Richard A. Baker, "Curriculum, Construction and Course Planning in Farm Power and Machinery," Agricultural Education Magazine, 38:136, December, 1965.

<sup>2</sup>L. J. Phipps, Handbook on Agricultural Education in Public Schools, p. 42.

<sup>3</sup>Kenneth M. Malone, "Pre-service Training Needs in Agricultural Mechanics for Prospective Vocational Agriculture Teachers" (Unpublished Master's thesis, West Virginia University, Morgantown, 1961).

abilities in the instructional program of vocational agriculture.

The second study was made by Dettman<sup>1</sup>, in 1965, at Iowa State University. Dettman surveyed the various competencies in agricultural mechanics that were needed by vocational agriculture teachers in Iowa.

The third study was made by Carnie<sup>2</sup>, in 1959, at the University of Idaho. Carnie conducted a study to determine the opinions of graduates of agricultural education who were teaching vocational agriculture at the time of his study with respect to the quality and importance of their pre-service agricultural mechanics training that they received at the University of Idaho.

This report resembled the study made by Carnie; however, some revisions were made which the writer of the report felt were necessary to make the study practical for Kansas.

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<sup>1</sup>Emeron P. Dettman, "Competencies in Agricultural Mechanics Needed by Vocational Agriculture Instructors" (Unpublished Master's Thesis, Iowa State University, Ames, 1965).

<sup>2</sup>George M. Carnie, "Evaluation of the Pre-service Training of Vocational Agriculture Instructors in Farm Mechanics" (Unpublished Master's Thesis, University of Idaho, Moscow, 1959).

## DESIGN AND METHOD OF RESEARCH

Research Design. This report was concerned with a descriptive type study. The study was designed to survey the opinions of teachers of vocational agriculture concerning possible strengths and weaknesses which they considered to be a part of the agricultural mechanics courses in the agricultural education curriculum at Kansas State University during the seven-year period prior to this study. It was assumed that such a survey would indicate possible improvements in the curriculum which would meet the training needs of prospective vocational agriculture teachers.

Method of Research. The information included in the findings section of this report was obtained by mailing an opinionnaire to all vocational agriculture teachers teaching in the State of Kansas during the 1967-68 school year who had taught one year or more and who had received their B. S. degree at Kansas State University from the years 1960 through 1966.

A cover letter stating the purpose of the opinionnaire was included with the opinionnaire. A copy of the cover letter and opinionnaire are included in the Appendix of this report. The cover letter was designed to emphasize that the purpose of the opinionnaire was to assist in keeping the agricultural mechanics training of vocational agriculture teachers realistic and up-to-date.

## METHOD OF PROCEDURE

First Phase of the Study. The first phase of this study involved a review of literature pertaining to the development of a curriculum for training teachers and the need for surveying the opinions of vocational agriculture teachers concerning their pre-service training in agricultural mechanics.

After the review of literature was conducted, a copy of the questionnaire used by Carniel<sup>1</sup>, in his study, was obtained and used as a basis in formulating an opinionnaire for this report. The writer then studied the content of each of the agricultural mechanics courses at Kansas State University, given to prospective vocational agriculture teachers. Changes which the writer considered necessary to make the opinionnaire practical for a similar study at Kansas State University were then made.

The opinionnaire was intended to contain, as far as possible, the agricultural mechanics abilities that were assumed to be essential in the pre-service training curriculum of future vocational agriculture teachers. In case the writer had left out some abilities needed by instructors to successfully teach vocational agriculture, space was provided to write in and rate the abilities.

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<sup>1</sup>Ibid.

The graduates were asked to rate the quality of agricultural mechanics training they received as undergraduate students at Kansas State University by rating the abilities listed on the opinionnaire as "Good," "Fair," or "Poor." If no training was offered in a particular ability at the time of the graduates' attendance at Kansas State University, or the respondents had not taken a course in which the ability was taught, they were to indicate this by checking the column entitled "No Training."

The respondents were asked to rate each agricultural mechanic's ability, whether or not he received training at Kansas State University, according to its importance to him as a teacher.

All respondents were also asked to give their opinion as to what per cent of the total instructional time in the high school vocational agriculture program should be devoted to agricultural mechanics instruction.

The Second Phase of the Study. The second phase of the study involved clarifying and improving the opinionnaire. The following three people were each given a copy of the opinionnaire: Allen Elstrom, vocational agriculture teacher; James Marstall, former vocational agriculture teacher; and Paul Roberts, high school principal. A copy of the opinionnaire was then given to Paul Stevenson, Associate Professor of Agricultural Mechanics at Kansas State University, for

evaluating, clarifying, and making recommendations he felt would improve the survey instrument. The opinionnaire was revised on the basis of these recommendations and then approved by the writer's major professor.

The instrument, in its completed form, consisted of a combined introductory letter and personnel data sheet and the opinionnaire which included seventeen areas of agricultural mechanics (see Appendix).

The opinionnaires were mailed to the selected forty-five vocational agriculture teachers who graduated from Kansas State University in agricultural education from the years 1960 through 1966, and who were teaching vocational agriculture in high schools in Kansas during the 1967-68 school year.

Ten days following the mailing of the opinionnaire, 91 per cent of the opinionnaires had been returned. A second opinionnaire was then sent to all instructors who had not returned the survey (see Appendix). Eight days later, all remaining surveys had been returned, bringing the total returns to 100 per cent.

Third Phase of the Study. The third phase of the study involved summarizing and analyzing the results of the opinionnaire. The responses of the teachers toward the quality and importance of agricultural mechanics training at Kansas State University were put into tables on a numerical

basis. In all cases, the numerical value in each area was based upon the total number of respondents checking the item. Since many graduates did not receive training in all areas, the number evaluating the quality of training varied with each ability.

All forty-five respondents rated the section of the opinionnaire dealing with the importance of training by rating each ability as "very important," "important," or "not important" to them as vocational agricultural instructors. According to the standards of this study, it was felt that if an ability was rated "very important," it should be stressed in the agriculture mechanics courses. If an ability was rated "important," it should be included in the agriculture mechanics curriculum. It was felt that an ability which was given a rating of "not important" should not be included in the agricultural mechanics courses.

All respondents also indicated the amount of total instructional time in the four-year high school vocational agriculture program which they felt should be devoted to agricultural mechanics.

#### PRESENTATION OF DATA

The data presented in this analysis were based upon the forty-five surveys returned by the agricultural education graduates of Kansas State University. The opinionnaires were summarized and the numerical values of vocational



agriculture teachers who rated all items were computed. This information was supplemented whenever possible by information written by the respondents on the opinionnaire in the space provided for individual comments and criticisms.

Items that were rated "very important" by 50 per cent or more of the teachers were considered worthy of emphasis, and according to the standards set forth in the study, should be stressed in the pre-service agricultural mechanics curriculum. Items in which the quality of training was rated as "good" by 50 per cent or more of the teachers were considered adequate in quality, according to the standards set forth in this study.

Not all respondents rated the quality of training for the various abilities in agricultural carpentry, as seen in Table I. The best quality of training, as rated by forty-one respondents, was received in the ability to "identify and use hand tools" which was rated as "good" in quality by 63 per cent of the respondents, as shown in Table I. The quality of training in the ability to "construct simple project" was second, receiving a rating of 56 per cent by twenty-four of the forty-three respondents. The quality of training in the ability to "figure bill of materials" was rated third, with 50 per cent of the forty-two respondents rating their training as "good." Training in the remaining five abilities was rated by less than 50 per cent of the respondents as "good" in quality.

TABLE I  
QUALITY AND IMPORTANCE OF  
AGRICULTURAL CARPENTRY TRAINING

Agricultural mechanics ability	Quality of training Number responding				Importance of training Number responding		
	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
Agricultural carpentry							
1. Making working drawing	20	19	5	1	28	17	0
2. Read blue print	14	21	8	2	27	18	0
3. Identify wood and lumber	3	13	16	13	14	27	4
4. Figure bill of material	21	16	5	3	30	15	0
5. Identify and use hand tools	26	14	1	4	28	19	0
6. Use and maintain power equipment	13	23	6	3	33	12	0
7. Construct simple project	24	18	1	2	26	17	2
8. Construct complex projects	10	21	7	7	21	21	3

All forty-five respondents rated the importance of training in agricultural carpentry. According to the graduates (Table I), the most important training in agricultural carpentry was the ability to "use and maintain power equipment," which was rated "very important" by 73 per cent of the respondents. All the remaining abilities were rated as "very

important" by the respondents except the ability to "construct complex project" and "identify wood and lumber."

Not all respondents rated the quality of training for the various abilities in forge and cold metal work, as shown in Table II. Of forty-three respondents rating training in the ability to "use metal lathe," 58 per cent rated their pre-service training as "good." The ability to "use tap and die" and "construct cold metal project," both were rated "good" by 52 per cent of the graduates. The remaining ten abilities in forge and cold metal work were rated below "good" in quality of training by the respondents.

All forty-five respondents rated the importance of training in the area of forge and cold metal work. The ability to "use the tap and die" received a "very important" rating from 69 per cent of the graduates. The importance of training of all other abilities was rated below "very important" by 50 per cent or more of the respondents except for the ability to "use metal lathe" and the ability to "identify metals."

Table III illustrated that none of the three abilities listed under quality of training in rope work were rated as "good" by 50 per cent of the six respondents.

The importance of training was rated by all forty-five of the graduates. There were no abilities in rope work that received a rating of "very important" by 50 per cent or more of the vocational agriculture teachers.

TABLE II  
QUALITY AND IMPORTANCE OF FORGE AND  
COLD METAL WORK TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Forge and cold metal work	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Build and main- tain forge fire (coal)	1	2	2	40	1	5	39
2. Build and main- tain forge fire (gas)	13	9	10	13	12	30	3
3. Identify metals	9	22	12	2	26	18	1
4. Identify and use forge tools	4	19	19	3	4	34	7
5. Heat metals	8	20	11	6	12	31	2
6. Shape metals	5	16	15	9	9	33	3
7. Punch hot metals	1	6	8	30	1	29	15
8. Weld	10	16	13	6	4	25	16
9. Use tap and die	22	14	6	3	31	14	0
10. Upset metal	1	8	7	29	5	28	12
11. Construct forge project	3	16	5	21	6	32	7
12. Construct cold metal project	22	17	3	3	18	25	2
13. Use metal lathe	25	17	1	2	27	17	1

TABLE III  
QUALITY AND IMPORTANCE OF  
ROPE WORK TRAINING

Agricultural mechanics ability	Quality of training				Importance of		
	Number responding				Number responding		
Rope work	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Tie common knots	1	2	3	39	5	22	18
2. Splice rope	0	0	3	42	3	18	22
3. Construct rope project	1	1	3	40	1	17	27

As shown by Table IV, two of the abilities in tool fitting received over a 50 per cent rating of "good" by the respondents. The quality of training for the ability to "sharpen a steel drill bit" received a "good" rating by 72 per cent of the forty-three instructors. The ability to "sharpen a cold chisel" was rated second, having received a "good" rating of 56 per cent by twenty-two of thirty-nine graduates. The training in the remaining twelve abilities was rated less than "good" in quality by 50 per cent or more of the respondents.

The importance of training for tool fitting was rated by all forty-five instructors. The highest rating of importance was the ability to "sharpen steel drill bit" which received a 77 per cent rating of "very important" from the graduates. Five other abilities in tool fitting received

TABLE IV  
QUALITY AND IMPORTANCE OF TOOL  
FITTING TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Tool fitting	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Fit handles	6	7	7	25	19	20	6
2. Sharpen cold chisel	22	14	3	6	30	13	2
3. Sharpen wood chisel	17	13	4	11	27	16	2
4. Sharpen hand saw	5	8	10	22	13	17	15
5. Sharpen screw driver	15	15	4	11	24	16	5
6. Sharpen steel drill bit	31	10	2	2	35	10	0
7. Sharpen wood auger bit	12	15	4	14	21	21	3
8. Sharpen axe	4	6	3	32	11	22	12
9. Sharpen circular saw	4	6	8	27	14	18	13
10. Sharpen tin snips	2	4	2	37	11	18	16
11. Sharpen plane iron	11	8	4	22	15	27	3
12. Draw out on anvil horn	2	2	2	39	3	15	27
13. Maintain common shop tools	13	21	8	3	32	13	0
14. Store common shop tools	18	17	4	6	24	19	2

"very important" ratings by 50 per cent or more of the vocational agriculture teachers.

The agricultural mechanics ability of "cutting glass" received the highest rating in regard to quality of training in the area of glazing as was seen in Table V. There were no abilities listed in glazing which received a "good" quality of training rating by over 50 per cent of the respondents.

TABLE V  
QUALITY AND IMPORTANCE OF  
GLAZING TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Glazing	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Repair sash	2	8	5	30	2	29	14
2. Measure glass	5	14	8	18	6	31	8
3. Cut glass	11	12	9	13	9	30	6
4. Prime sash	1	7	6	31	3	30	12
5. Press glazier points	8	11	9	17	3	30	12
6. Apply putty	9	12	8	16	11	26	8
7. Paint putty	2	8	5	30	6	28	11
8. Fit screen window or door	1	6	3	35	8	21	16

Each of the forty-five graduates rated the importance of training in the area of glazing. There were no abilities that were rated as "very important" by 50 per cent or more of the instructors in glazing.

Not all of the respondents rated the quality of training for the various abilities in soldering and sheet metal as shown in Table VI. The best quality of training, as rated by thirty-nine respondents, was received in the ability to "solder seams" which was rated as "good" in quality by 69 per cent of the respondents.

The importance of training in soldering and sheet metal was rated by all forty-five. The ability to "solder electric wiring joints" was rated as "very important" by 67 per cent of the teachers. Sixty-two per cent of the graduates rated the ability of "servicing soldering copper" as being "very important." The ability to "clean metal" and the ability to "select and use flux" were given a "very important" rating by 60 per cent of the respondents.

Not all respondents rated the quality of training for the various abilities in painting as shown in Table VII. There were no abilities which received 50 per cent or more rating of "good" by those responding.

All forty-five graduates responded to the rating of importance of training in the area of painting. The ability to "operate and maintain a paint sprayer" received a "very important" rating by 84 per cent of those responding.



TABLE VI  
QUALITY AND IMPORTANCE OF SOLDERING  
AND SHEET METAL TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Soldering and sheet metal	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Generate blow torch	8	5	3	29	8	2	16
2. Service blow torch	5	5	3	32	6	23	16
3. Service soldering copper	21	10	6	8	28	18	4
4. Clean metal	20	14	6	5	27	16	2
5. Select and use flux	14	19	6	6	27	18	0
6. Operate electric copper	11	13	9	12	25	19	1
7. Solder hole	24	14	2	5	24	18	3
8. Sweat on patch	24	12	3	6	24	18	3
9. Solder seams	27	10	2	6	24	18	3
10. Solder copper tubing	10	8	5	22	21	22	2
11. Solder electric wiring joints	15	12	5	13	30	14	1
12. Construct sheet metal	13	12	4	16	16	24	5

TABLE VII  
QUALITY AND IMPORTANCE OF  
PAINTING TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Painting	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Mix paint from basic ingredients	3	6	8	28	8	16	21
2. Select paint	7	23	7	8	27	15	3
3. Tint paint	5	8	5	27	9	24	12
4. Apply paint with brush	10	21	4	10	22	17	6
5. Clean paint brushes	15	16	5	9	24	18	3
6. Store paint brushes	14	16	4	11	22	20	3
7. Operate and main- tain paint sprayer	13	14	7	11	38	7	0

Sixty per cent of the vocational agriculture teachers rated the ability to "select paint" as being "very important."

The quality and importance of training in arc welding are shown in Table VIII. The quality of training received for the ability to "weld steel in flat position" was rated "good" by 80 per cent of all forty-five respondents. Seventy-one per cent of all forty-five respondents rated the quality of training to "identify electrodes" to be "good." Out of forty-five respondents, 68 per cent rated the quality of training in

TABLE VIII  
QUALITY AND IMPORTANCE OF  
ARC WELDING TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Arc welding	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Install arc welder	6	8	4	27	17	20	8
2. Prepare metal for welding	31	13	1	0	34	11	0
3. Identify electrodes	32	10	3	0	35	10	0
4. Weld steel in flat position	36	7	2	0	40	5	0
5. Weld steel in horizontal position	29	12	4	0	39	6	0
6. Weld steel in vertical position	28	13	4	0	38	7	0
7. Weld steel in overhead position	13	15	9	8	27	15	3
8. Weld pipe	21	15	3	6	37	8	0
9. Weld cast iron	12	14	12	7	33	12	0
10. Weld cast iron to steel	7	11	10	17	26	18	1
11. Hard surface	10	16	9	10	26	16	3
12. Solder	11	12	5	17	20	22	3
13. Cut	19	6	6	14	33	12	0
14. Operate carbon arc torch	8	14	11	12	23	21	1
15. Repair or construct implement	12	15	6	13	30	14	1

"preparing metal for welding" as "good." Other areas which received a rating of 50 per cent or more were "weld steel in horizontal position" and "weld steel in vertical position."

All forty-five graduates rated the importance of training in arc welding. The ability to "weld steel in flat position" was rated "very important" by 88 per cent of the teachers, while the ability to "weld steel in horizontal position" was second, with a total of 87 per cent rating as "very important." There were seven other areas which were rated as "very important" by 50 per cent or more of the graduates.

One vocational agriculture teacher stated that more training in micro-wire and heli-arc was needed. Another graduate added that more time needed to be spent in the area of welding in agricultural mechanics courses.

Table IX shows that not all graduates had training in the area of oxy-acetylene welding. Of the forty-one respondents, 85 per cent rated their training to "cut" as being "good." Of the forty-five teachers who rated the ability to "weld steel by fusion," 75 per cent rated that ability "good." Two other abilities in oxy-acetylene welding were rated as "good" by 50 per cent or more of those responding.

All forty-five vocational agriculture teachers rated the importance of training in the area of oxy-acetylene welding. The ability to "cut" was rated as being "very important" by 82 per cent of the teachers. Training in all

TABLE IX  
QUALITY AND IMPORTANCE OF  
OXY-ACETYLENE WELDING TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Oxy-acetylene welding	Good	Fair	Poor	No training	Very imp.	Imp.	Not imp.
1. Install oxy-acetylene welder	20	8	5	12	23	19	3
2. Weld steel by fusion	33	8	3	1	34	10	1
3. Weld steel with steel filter rod	31	11	3	0	35	10	0
4. Weld steel with bronze filter rod	28	14	2	1	35	10	0
5. Weld cast iron with cast iron rod	9	12	12	12	29	14	2
6. Weld aluminum	5	9	13	18	22	19	4
7. Solder	10	7	8	20	16	24	5
8. Hard surface	10	20	5	10	25	19	1
9. Cut	35	6	3	1	37	8	0
10. Repair or construct project	10	20	3	12	25	17	3

other abilities of oxy-acetylene welding received a "very important" rating by 50 per cent or more of the respondents, except training in the abilities of "weld aluminum" and "solder."

As shown in Table X, not all graduates received training in all abilities in concrete and masonry. However, all forty-five graduates had training in "determining quantities needed" and 66 per cent of these teachers rated the quality of this training as "good." Forty-four graduates rated the ability to "mix concrete," and 65 per cent gave a rating of "good" to the quality of the training. Five other areas also received a "good" rating by 50 per cent or more of the instructors.

Of all forty-five respondents to importance of training in concrete and masonry, 77 per cent rated "mix concrete" as being "very important." All other abilities in concrete and masonry were rated "very important" by 50 per cent or more of all forty-five graduates, with the exception of the ability to "lay brick."

Not all respondents rated the quality of training for the various abilities in plumbing and sanitation. As seen in Table XI, there were no abilities that were rated "good" by 50 per cent or more of the respondents.

All graduates rated importance of training in the plumbing and sanitation abilities, but there were no abilities rated as "very important" by 50 per cent or more of those responding.

The quality of training in heating and ventilation was not rated by all teachers, as shown in Table XII.

TABLE X  
QUALITY AND IMPORTANCE OF CONCRETE  
AND MASONRY TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Concrete and masonry	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Prepare base	13	19	7	6	25	19	1
2. Construct form	14	21	6	4	26	19	0
3. Place reinforce- ments	16	18	5	6	29	16	0
4. Determine mix	28	15	2	0	32	13	0
5. Determine quanti- ties needed	30	12	3	0	34	11	0
6. Mix concrete	29	15	0	1	35	10	0
7. Pour concrete	27	16	0	2	33	12	0
8. Finish concrete	27	16	1	1	33	12	0
9. Cure concrete	24	16	4	1	33	12	0
10. Lay out founda- tion	14	19	7	5	29	16	0
11. Construct concrete wall	15	16	2	12	23	19	3
12. Lay brick	7	4	7	27	17	25	3
13. Lay concrete block	25	13	3	4	29	16	0

TABLE XI  
QUALITY AND IMPORTANCE OF PLUMBING  
AND SANITATION TRAINING

Agricultural mechanics ability	Quality of training				Importance of		
	Number responding				Number responding		
Plumbing and sanitation	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Measure pipe	3	17	3	22	15	25	5
2. Cut pipe	4	13	6	22	13	26	6
3. Ream pipe	4	12	7	22	9	30	6
4. Thread pipe	11	5	5	24	18	25	2
5. Repair water faucet	3	0	5	37	9	24	12
6. Install hot water tank	0	0	5	40	3	25	17
7. Install pressure water system	0	3	7	35	4	28	13
8. Install sewage system	3	6	6	30	6	27	12



TABLE XII  
QUALITY AND IMPORTANCE OF HEATING  
AND VENTILATION TRAINING

Agricultural mechanics ability	Quality of training				Importance of		
	Number responding				Number responding		
Heating and ventilation	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Maintain furnace	0	2	2	41	1	21	23
2. Install door or window strip	1	3	1	40	3	23	19
3. Fit storm sash	1	3	2	39	2	23	20
4. Caulk	2	4	2	37	3	27	15
5. Insulate building	6	10	7	22	12	25	8

There were no abilities rated "good" by 50 per cent or more of the respondents.

All graduates rated the importance of training in the area of heating and ventilation, but no abilities were rated as "very important" by 50 per cent or more of those responding.

Table XIII shows that not all teachers rated the quality of training in agricultural electricity. Of the forty-four who rated the ability to "understand electrical terms," 65 per cent rated the quality of training as "good." Two other abilities, "read meter" and "understand principles of electricity," were rated as "good" by 50 per cent or more of the agriculture instructors.

TABLE XIII  
QUALITY AND IMPORTANCE OF AGRICULTURAL  
ELECTRICITY TRAINING

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Agricultural electricity	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Understand prin- ciples of elec- tricity	26	12	6	1	40	5	0
2. Understand elec- trical terms	29	12	3	1	38	7	0
3. Plan farmstead wiring	17	20	7	1	33	12	0
4. Identify and use wiring materials	16	21	7	1	39	6	0
5. Wire buildings	12	18	7	8	32	13	0
6. Select and install fuses	21	16	6	2	35	10	0
7. Read meter	28	11	2	4	26	17	2
8. Select electric meter	12	9	7	17	18	19	8
9. Service meter	15	16	8	6	39	6	0

All forty-five graduates rated the importance of training in agricultural electricity. According to the graduates (Table XIII), the most important training in agricultural electricity was the ability to "understand principles of electricity," which was rated "very important" by 88 per cent of the respondents. Training in the abilities to "identify

and use wiring materials" and "service meter" received "very important" ratings by 87 per cent of the graduates. All other areas in agricultural electricity received "very important" ratings by 50 per cent or more of the vocational agriculture teachers with the exception of the ability to "select electric meter."

All of the graduates did not rate the quality of training in tractor maintenance, as seen in Table XIV. Thirteen of the forty-two abilities were given a quality rating of "good" by 50 per cent or more of the instructors. The quality of training to "adjust spark plugs" was rated by forty-three graduates, of which 65 per cent rated the quality as "good."

The importance of training in tractor maintenance was rated by all forty-five respondents. According to the ratings by the teachers (Table XIV), the most important ability was "time ignition," which was rated by 80 per cent as "very important." There were twenty-three of the forty-two abilities which received a "very important" rating by 50 per cent or more of the vocational agriculture instructors.

Not all graduates had training in the area of farm power overhaul, as shown in Table XV. There was one ability which received a quality rating of "good" by 50 per cent or more of the vocational agriculture teachers. The ability to "grind valves" received a "good" quality rating by twenty-six of the forty-five teachers.

TABLE XIV  
QUALITY AND IMPORTANCE OF TRACTOR  
MAINTENANCE TRAINING

Agricultural mechanics ability	Quality of training Number responding				Importance of training Number responding		
				No train- ing	Very imp.	Imp.	Not imp.
Tractor maintenance	Good	Fair	Poor				
1. Cooling system							
a. Flush radiator	10	13	5	17	26	17	2
b. Select coolant	11	15	5	14	19	21	5
c. Install radi- ator hoses	10	14	3	18	22	19	4
d. Inspect thermo- stat	13	17	4	11	22	20	3
e. Install water pump	6	14	6	19	21	23	1
f. Pack water pump	3	10	6	26	18	22	5
g. Adjust fan belt	17	15	3	10	27	15	3
2. Lubrication							
a. Change engine oil	21	13	0	11	29	11	5
b. Flush crankcase	11	13	6	15	17	25	3
c. Flush differ- ential	5	13	5	22	15	26	4
d. Flush trans- mission	5	12	3	25	15	26	4
e. Grease chasis assemblies	10	7	2	26	24	15	6
f. Pack front wheel bearings	23	13	2	7	30	15	0

TABLE XIV (continued)

Agricultural mechanics ability	Quality of training				Importance of training		
	Number responding				Number responding		
Tractor maintenance	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
g. Clean breather cap	21	14	2	8	25	18	2
h. Service oil filter	21	14	3	7	26	17	2
i. Clean air filter	18	16	2	9	26	16	3
3. Electrical system							
a. Time ignition	26	11	8	0	36	9	0
b. Install new breaker points	19	15	6	5	32	13	0
c. Adjust spark plugs	28	14	1	2	31	14	0
d. Select spark plugs	21	17	2	5	29	16	0
e. Replace wiring	11	16	6	12	22	22	1
f. Remove and install magneto	17	16	3	9	17	21	7
g. Polish generator and starter	6	10	5	24	16	22	7
h. Install gener- ator brushes	7	10	1	27	26	17	2
i. Adjust gener- ator changing rate	3	10	5	27	19	24	2
j. Tighten gener- ator belt	13	15	2	15	22	17	6
k. Test for spec- ific gravity	10	17	3	15	16	24	5

TABLE XIV (continued)

Agricultural mechanics ability	Quality of training Number responding				Importance of training Number responding			
	Tractor maintenance	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Add water to storage battery	21	11	2	11	23	16	6	
m. Replace fuses	11	8	5	21	22	16	7	
4. Carburetion and fuel								
a. Clean carburetor	18	19	2	6	31	14	0	
b. Adjust power jet	21	16	4	4	30	15	0	
c. Adjust idling mixture jet	22	16	5	2	31	14	0	
d. Adjust idling speed	22	15	6	2	30	15	0	
e. Clean sediment bowl	27	11	3	4	29	15	1	
f. Service diesel fuel system	5	8	11	21	29	15	1	
5. General								
a. Adjust brakes	7	13	5	20	30	15	0	
b. Adjust clutch	6	12	7	20	29	16	0	
c. Trouble shoot	6	16	12	11	34	11	0	
d. Adjust tappets	10	19	8	8	25	19	1	
e. Maintain tires	16	16	6	7	23	17	5	
f. Store tractor properly	12	18	4	11	22	21	2	
g. Practice tractor safety	17	20	4	4	33	12	0	

TABLE XV  
QUALITY AND IMPORTANCE OF FARM POWER  
UNIT OVERHAUL TRAINING

Agricultural mechanics ability	Quality of training				Importance of		
	Number responding				Number responding		
Farm power overhaul	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Grind valves	26	14	4	1	29	15	1
2. Service connecting rods	15	13	9	8	27	15	3
3. Service main bearings	13	13	7	12	25	18	1
4. Install piston rings	22	16	5	2	28	15	2
5. Reline brakes	3	10	8	24	24	14	7
6. Rebuild water pump	2	6	6	31	10	21	14
7. Overhaul trans- mission	2	2	7	34	12	20	13
8. Overhaul differ- ential	2	2	6	35	12	22	11
9. Maintain and service hydraulic system	5	9	8	23	26	19	0

All forty-five respondents rated the importance of training in the area of farm power overhaul. The ability to "grind valves" was rated as "very important" by 64 per cent of the forty-five graduates. It was noted that 62 per cent of the teachers rated the ability to "install piston rings" as being "very important." There were four other abilities in

the area of farm power overhaul which were rated as "very important" by 50 per cent or more of those responding.

Three write-ins expressed by the teachers in regard to training in farm power overhaul were: (1) the need for more small and large engine work, (2) the need for more work on overhauling diesel tractors, and (3) the need for more on combine and baler adjustment.

In the area of agricultural machinery repair, adjustment, and service, Table XVI shows that not all abilities were rated as to quality of training. Of those who received training, there were no abilities that received a rating of "good" by 50 per cent or more of the teachers.

Importance of training was rated by all forty-five graduates. All abilities in agricultural machinery received a "very important" rating by 50 per cent or more of the graduates. The one considered most important by the teachers (Table XVI) was "spraying equipment" which was rated "very important" by 71 per cent of the teachers. "Harvesting equipment" was second, being rated by 68 per cent of the graduates as "very important."

Table XVII shows that not all respondents rated the quality training in the area of irrigation and drainage. Of the forty-three responding, 88 per cent rated the quality of training to "operate farm level" as being "good." The ability to "lay out contour lines" was rated "good" by 78 per cent of the forty-two respondents rating that ability.



TABLE XVI  
 QUALITY AND IMPORTANCE OF AGRICULTURAL  
 MACHINERY REPAIR, ADJUSTMENT,  
 AND SERVICE TRAINING

Agricultural mechanics ability	Quality of training Number responding				Importance of training Number responding		
Agricultural machin- ery repair, adjust- ment, service	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
1. Seed-bed prepara- tion equipment	5	17	12	11	27	15	3
2. Seeding equipment	8	17	8	12	29	13	3
3. Tillage equipment	8	17	12	8	27	14	4
4. Harvesting equip- ment	7	16	11	11	31	11	3
5. Fertilizing equip- ment	2	11	14	18	27	15	3
6. Spraying equipment	12	17	10	6	32	10	3

TABLE XVII  
QUALITY AND IMPORTANCE OF IRRIGATION  
AND DRAINAGE TRAINING

Agricultural mechanics ability	Quality of training Number responding				Importance of training Number responding		
	Good	Fair	Poor	No train- ing	Very imp.	Imp.	Not imp.
Irrigation and drainage							
1. Lay drainage tile	0	6	5	34	3	25	17
2. Operate sprinkler irrigation	0	3	5	37	12	26	7
3. Operate ditch irrigation	0	4	4	37	12	27	6
4. Lay out tenace	22	18	3	2	29	15	1
5. Operate farm level	38	5	0	2	36	8	1
6. Construct grass waterway	9	14	8	14	23	18	4
7. Lay out farmstead	19	14	6	6	24	20	1
8. Construct farm pond	4	8	6	27	17	22	6
9. Lay out contour lines	33	9	0	3	23	20	2
10. Construct head gates	3	2	7	33	10	25	10

All graduates rated the importance of training in irrigation and drainage. The ability to "operate farm level" was considered most important by the teachers (Table XVII). Eighty per cent of the forty-five instructors rated this ability as "very important." Four other areas also were

rated "very important" by 50 per cent or more of those responding.

As noted in Table XVIII, twelve or 27 per cent of the respondents indicated that 30-40 per cent of the instructional time should be spent in agricultural mechanics. Twenty-two or 49 per cent of the teachers of vocational agriculture chose the 40-50 per cent instructional time as the correct amount of instructional time for teaching agricultural mechanics in the high school vocational agriculture program. Six or 13 per cent indicated that 50-60 per cent of the instructional time should be spent in agricultural mechanics.

TABLE XVIII

PER CENT OF TOTAL INSTRUCTIONAL TIME IN HIGH SCHOOL  
VOCATIONAL AGRICULTURE THAT SHOULD BE ALLOTTED  
TO AGRICULTURAL MECHANICS AS RATED BY  
FORTY-FIVE GRADUATES

Time to be spent in agricultural mechanics during four years	Total number graduates rating	Per cent graduates rating
30 per cent or less	3	7
30-40 per cent	12	27
40-50 per cent	22	49
50-60 per cent	6	13
60-70 per cent	2	4
70 per cent or more	0	0
Total	45	100

## SUMMARY

The purpose of this study was to survey the opinions of selected vocational agriculture teachers concerning the adequacy of their training in selected agricultural mechanics abilities and to determine the importance which the selected vocational agriculture teachers had attached to their instruction in selected agricultural mechanics abilities.

The teachers of vocational agriculture selected for the study consisted of all vocational agriculture teachers teaching in the State of Kansas during the 1967-68 school year who had taught one year or more and who had received their B. S. degree at Kansas State University from the years 1960 through 1966.

The questionnaire method was used in conducting the investigation. An opinionnaire was mailed to forty-five teachers of vocational agriculture. Of the forty-five forms sent to the teachers, 100 per cent were returned and included in this report.

The opinionnaire included 192 abilities in the following seventeen areas of agricultural mechanics: agricultural carpentry; forge and cold metal work; rope work; tool fitting; glazing; soldering and sheet metal work; painting; arc welding; oxy-acetylene welding; concrete and masonry; plumbing and sanitation; heating and ventilation;

agricultural electricity; tractor maintenance; farm power unit overhaul; agricultural machinery, repair, adjustment, and service; and irrigation and drainage. In addition, the respondents were asked to indicate how much time should be allotted to agricultural mechanics in high school as a part of the four-year vocational agriculture program.

As a result of this investigation, an attempt was made to segregate the very important abilities from the abilities that should not have been included in the agricultural mechanics curriculum and also to identify those abilities in which training could be included in the curriculum. Training in all abilities that were rated "very important" by 50 per cent or more of the respondents was considered significant enough to be stressed in the pre-service agricultural mechanics curriculum at Kansas State University.

In proposing a list of "very important" agricultural mechanics abilities in which the training should be stressed in the agricultural mechanics curriculum, the writer found that training in all abilities in the following six areas were rated "very important" by 50 per cent or more of the forty-five respondents: (1) training in all agricultural carpentry abilities with the exception of the ability to "identify wood and lumber" and the ability to "construct complex project"; (3) training in all agricultural electricity abilities with the exception of the ability to "select electric meter"; (4) training in all concrete and masonry

abilities with the exception of the ability to "lay brick"; (5) training in all arc welding abilities except the abilities to "install welder" and the ability to "solder"; and (6) training in all oxy-acetylene welding abilities with the exception of the abilities to "weld aluminum" and the ability to "solder."

It was noted that all of the abilities in four of the six agricultural mechanics areas that were rated as "very important" by 50 per cent or more vocational agriculture teachers in Kansas also were rated as "very important" by 50 per cent or more of the teachers of vocational agriculture in Idaho in a similar study by Carnie.<sup>1</sup> The four agricultural mechanics areas were the following: oxy-acetylene welding; arc welding; agricultural electricity; and agricultural machinery repair, adjustment, and service.

It was noted that training in fifty-five other abilities included in the seven areas of agricultural mechanics, as listed in Table XIX, received "very important" ratings by 50 per cent or more of the forty-five respondents. Table XIX consists of a listing of the fifty-five abilities by areas.

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<sup>1</sup>George M. Carnie, "Evaluation of the Pre-service Training of Vocational Agriculture Instructors in Farm Mechanics" (Unpublished Master's Thesis, University of Idaho, Moscow, 1959).

TABLE XIX

ABILITIES LISTED BY AREA THAT RECEIVED VERY  
IMPORTANT RATINGS BY OVER 50 PER CENT  
OF THE FORTY-FIVE RESPONDENTS

Agricultural area	Agricultural ability
1. Forge and cold metal work	Identify metals Use tap and die Use metal lathe
2. Tool fitting	Sharpen cold chisel Sharpen wood chisel Sharpen screw driver Sharpen steel drill bit Maintain common shop tools Store common shop tools
3. Soldering and sheet metal	Service soldering copper Clean metal Select and use flux Operate electric copper Solder hole Sweat on patch Solder seams Solder electric wiring joints
4. Painting	Select paint Clean paint brushes Operate and maintain paint sprayer
5. Tractor maintenance	Flush radiator Adjust fan belt Change engine oil Grease chassis assemblies Pack front wheel bearings Clean breather cap Time ignition Install generator brushes Add water to storage battery Clean carburetor Adjust power jet Adjust idling mixture jet Adjust idling speed Clean sediment bowl Service diesel fuel system Adjust breakers

TABLE XIX (continued)

Agricultural area	Agricultural ability
Tractor maintenance	Adjust clutch Trouble shoot Adjust tappets Maintain tires Practice tractor safety
	Grind valves Service connecting rods Service main bearings Install piston rings Reline brakes Maintain and service hydraulic system
6. Farm power overhaul	Lay out terrace Operate farm level Construct grass waterway Lay out farmstead Lay out contour lines
7. Irrigation and drainage	

There were four abilities listed on the opinionnaire that received a rating of "not important" by 50 per cent or more of the instructors. They were: (1) the ability to "build and maintain a forge fire 'coal'" in the area of forge and cold metal work, (2) the ability to "construct rope project" in the area of rope work, (3) the ability to "draw out on anvil horn" in the area of tool fitting, and (4) the ability to "maintain furnace" in the area of heating and ventilation.

The opinionnaire contained one question which asked the teacher's opinion concerning the total instructional time in the high school vocational agriculture program that



should be devoted to agricultural mechanics. Twenty-two of the forty-five respondents indicated that 40-50 per cent of the total instructional time should be spent in agricultural mechanics. Twelve teachers responded that 30-40 per cent of the instructional time should be spent in agricultural mechanics. Six instructors indicated that 50-60 per cent of the instructional time should be spent in agricultural mechanics in the high school vocational agriculture program.

A comparison of the quality and importance of agricultural mechanics training was made in Table XX. The respondents were asked to rate the adequacy of their pre-service agricultural mechanics training in preparation for developing that particular ability in their vocational agriculture students. The graduates rated only those abilities in which pre-service training was received at Kansas State University.

In comparing the quality and importance in tractor maintenance, the findings indicate that while twenty-six of the tractor maintenance abilities were rated "very important" by the majority of respondents, thirteen abilities were rated "good" leaving twelve abilities as having less than "good" in quality of training. In the area of agricultural machinery, repair, adjustment, and service, there were no abilities receiving a "good" quality of rating while six of the abilities in that area received a rating of "very important."

TABLE XX  
COMPARISON OF QUALITY AND IMPORTANCE OF TRAINING  
AS RATED BY 50 PER CENT OR MORE  
OF THE RESPONDENTS

Agricultural mechanics ability	No. of abilities in area	Quality of training	Importance of training
		Good	Very im- portant
Agricultural carpentry	8	3	6
Forge and cold metal work	13	3	4
Tool fitting	14	2	6
Soldering and sheet metal	12	4	8
Painting	7	0	3
Arc welding	15	7	13
Oxy-acetylene welding	11	5	10
Concrete and masonry	13	7	12
Agricultural electricity	9	3	8
Tractor maintenance	42	13	26
Farm power overhaul	9	2	6
Agricultural machinery repair, adjust, and service	6	0	6
Irrigation and drainage	10	3	5

It was noted that three abilities in the agricultural mechanics area of agricultural electricity were rated "good" in quality by 50 per cent or more of the graduates while eight abilities in the area of agricultural electricity were rated "very important" by the teachers. It might be concluded that these areas need to be examined and emphasized to a greater degree.

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## APPENDIX

Mankato, Kansas  
November 29, 1967

Dear

What shall we teach the future vocational agriculture instructor?

The agricultural education department needs your help to keep the agricultural mechanics curriculum at Kansas State University realistic and up-to-date.

Would you please complete the following opinionnaire and return it in the enclosed self-addressed, stamped envelope.

Your answers will not be identified with you personally. Upon receipt of your reply, this page will be immediately removed from the opinionnaire.

Sincerely,

Marvin Mann  
Graduate Student and  
Vocational Agriculture Instructor

---

INFORMATION NEEDED TO SUMMARIZE THE DATA

Name \_\_\_\_\_ Year Graduated \_\_\_\_\_

Present Address \_\_\_\_\_

Years teaching experience in vocational agriculture \_\_\_\_\_

I would like a copy of the summary of the findings of the opinionnaire.

Yes \_\_\_\_\_ No \_\_\_\_\_

OPINION/IRE OF THE PRE-SERVICE  
TRAINING OF VOCATIONL AGRICULTURE INSTRUCTORS  
IN AGRICULTURAL MECHANICS

Opposite each agricultural mechanics ability listed below, please mark the column which most accurately describes your opinion of the adequacy of training you received in undergraduate courses at Kansas State University in preparation for developing that particular ability in your vocational agriculture students.

If no pre-service training was received in a particular area, please indicate by checking the fourth column. (No Training Received)

In the last column, please rate each of the farm mechanics abilities, whether you received training or not, according to its importance to you by using the numbers 1, 2, or 3.

- 1 - Very important, definitely should be offered.
- 2 - Important, should be offered.
- 3 - Not important, should not be offered.

If an ability was excluded from the survey, please feel free to write it in under other and evaluate the ability.

Agricultural Mechanics Ability	Opinion of Training				Importance of Training
	Good	Fair	Poor	No Training Received	
A. Agricultural Carpentry					
1. Make working drawing					
2. Read blue print					
3. Identify wood and lumber					
4. Figure bill of material					
5. Identify and use hand tools					
6. Use and maintain power equip.					
7. Construct simple project					
8. Construct complex project					
9. Other					

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Agricultural Mechanics Ability	Opinion of Training				Importance of Training
	Good	Fair	Poor	No Training Received	
<b>B. Forge and Cold Metal Work</b>					
1. Build and maintain forge fire (coal)					
2. Build and maintain forge fire (gas)					
3. Identify metals					
4. Identify and use forge tools					
5. Heat metals					
6. Shape metals					
7. Punch hot metals					
8. Weld					
9. Use tap and die					
10. Upset metal					
11. Construct forge project					
12. Construct cold metal project					
13. Use metal lathe					
<b>C. Rope Work</b>					
1. Tie common knots					
2. Splice rope					
3. Construct rope project					
<b>D. Tool Fitting</b>					
1. Fit handles					
2. Sharpen cold chisel					
3. Sharpen wood chisel					
4. Sharpen hand saw					
5. Sharpen screw driver					
6. Sharpen steel drill bit					
7. Sharpen wood auger bit					
8. Sharpen axe					
9. Sharpen circular saw					
10. Sharpen tin snips					
11. Sharpen plane iron					
12. Draw out anvil horn					
13. Maintain common shop tools					
14. Store common shop tools					
<b>E. Glazing</b>					
1. Repair sash					
2. Measure glass					
3. Cut glass					
4. Prime sash					
5. Press Glazier points					
6. Apply putty					
7. Paint putty					
8. Fit screen on window or door					



Agricultural Mechanics Ability	Opinion of Training				
	Good	Fair	Poor	No Training Received	Importance of Training
<b>F. Soldering and Sheet Metal</b>					
1. Generate blow torch					
2. Service blow torch					
3. Service soldering copper					
4. Clean metal					
5. Select and use flux					
6. Operate electric copper					
7. Solder hole					
8. Sweat on patch					
9. Solder seams					
10. Solder copper tubing					
11. Solder electric wiring joints					
12. Construct sheet metal					
<b>G. Painting</b>					
1. Mix paint from basic ingredients					
2. Select paint					
3. Tint paint					
4. Apply paint with brush					
5. Clean paint brushes					
6. Store paint brushes					
7. Operate and maintain paint sprayer					
<b>H. Arc Welding</b>					
1. Install arc welder					
2. Prepare metal for welding					
3. Identify electrodes					
4. Weld steel in flat position					
5. Weld steel in horizontal position					
6. Weld steel in vertical position					
7. Weld steel in overhead position					
8. Weld pipe					
9. Weld cast iron					
10. Weld cast iron to steel					
11. Hard surface					
12. Solder					
13. Cut					
14. Operate carbon arc torch					
15. Repair or construct implement					

Agricultural Mechanics Ability	Opinion of Training			Importance of Training
	Good	Fair	Poor	
<b>I. Oxy-Acetylene Welding</b>				
1. Install oxy-acetylene welder				
2. Weld steel by fusion				
3. Weld steel with steel filler rod				
4. Weld steel with bronze filler rod				
5. Weld cast iron with cast iron rod				
6. Weld cast iron with cast iron rod				
7. Weld aluminum				
8. Solder				
9. Hard surface				
10. Cut				
11. Repair or construct project				
<b>J. Concrete and Masonry</b>				
1. Prepare base				
2. Construct form				
3. Place reinforcements				
4. Determine mix				
5. Determine quantities needed				
6. Mix concrete				
7. Pour concrete				
8. Finish concrete				
9. Cure concrete				
10. Layout foundation				
11. Construct concrete wall				
12. Lay brick				
13. Lay concrete block				
<b>K. Plumbing and Sanitation</b>				
1. Measure pipe				
2. Cut pipe				
3. Ream pipe				
4. Thread pipe				
5. Repair water faucet				
6. Install hot water tank				
7. Install pressure water system				
8. Install sewage system				

## Agricultural Mechanics Ability

Good Fair

## Opinion of Training

Poor No Training  
ReceivedImportance of  
Training

## L. Heating and Ventilation

1. Maintain furnace
2. Install door or window strip
3. Fit storm sash
4. Caulk
5. Insulate building

## M. Agricultural Electricity

1. Understand principles of electricity
2. Understand electrical terms
3. Plan farmstead wiring
4. Identify and use wiring materials
5. Wire buildings
6. Select and install fuses
7. Read meter
8. Select electric meter
9. Service motor

## N. Tractor Maintenance

1. Cooling System
  - a. Flush radiator
  - b. Select coolant
  - c. Install radiator hoses
  - d. Inspect thermostat
  - e. Install water pump
  - f. Pack water pump
  - g. Adjust fan belt
2. Lubrication
  - a. Change engine oil
  - b. Flush crankcase
  - c. Flush differential
  - d. Flush transmission
  - e. Grease chassis assemblies
  - f. Pack front wheel bearings
  - g. Clean breather cap
  - h. Service oil filter
  - i. Clean air filter
3. Electrical System
  - a. Time ignition
  - b. Install new breaker points
  - c. Adjust spark plugs
  - d. Select spark plugs
  - e. Replace wiring

Agricultural Mechanics Ability	Opinion of Training				Importance of Training
	Good	Fair	Poor	No Training Received	
f. Remove and install magneto					
g. Polish generator and starter					
h. Install generator brushes					
i. Adjust generator charging rate					
j. Tighten generator belt					
k. Test for specific gravity					
l. Add water to storage battery					
m. Replace fuses					
4. Carburetion and Fuel					
a. Clean carburetor					
b. Adjust power jet					
c. Adjust idling mixture jet					
d. Adjust idling speed					
e. Clean sediment bowl					
f. Service diesel fuel system					
5. General					
a. Adjust brakes					
b. Adjust clutch					
c. Trouble shoot					
d. Adjust tappets					
e. Maintain tires					
f. Store tractor properly					
g. Practice tractor safety					
h. Other					
0. Farm Power Unit Overhaul					
1. Grind valves					
2. Service connecting rods					
3. Service main bearings					
4. Install piston rings					
5. Reline brakes					
6. Rebuild water pump					
7. Overhaul transmission					
8. Overhaul differential					
9. Maintain and service Hydraulic system					
10. Other					

Agricultural Mechanics Ability	Opinion of Training				Importance of Training
	Good	Fair	Poor	No Training Received	
<b>P. Agricultural Machinery</b> Repair, Adjust, and Service					
1. Seed-bed preparation equipment					
2. Seeding equipment					
3. Tillage equipment					
4. Harvesting equipment					
5. Fertilizing equipment					
6. Spraying equipment					
<b>Q. Irrigation and Drainsge</b>					
1. Lay drainage tile					
2. Operate sprinkler irrigation					
3. Operate ditch irrigation					
4. Lay out terrace					
5. Operate farm level					
6. Construct grassed waterway					
7. Lay out farmstead					
8. Construct farm pond					
9. Lay out contour lines					
10. Construct head gates					

In your opinion, how much of the total instructional time in high school should be spent in the area of agricultural mechanics? Thirty per cent or less \_\_\_\_\_; Thirty to forty per cent \_\_\_\_\_; Forty to fifty per cent \_\_\_\_\_; Fifty to sixty per cent \_\_\_\_\_; Sixty to seventy per cent \_\_\_\_\_; Seventy per cent or more \_\_\_\_\_?

Please list any criticisms or suggestions in the space below that you feel would benefit the pre-service agricultural mechanics training program at Kansas State University.

Thank You

SELECTED AGRICULTURAL MECHANICS ABILITIES  
AS RATED BY TEACHERS OF VOCATIONAL AGRICULTURE

by

MARVIN WILLIS MANN

B. S., Kansas State University, 1966

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

College of Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1968

The purpose of this study was to survey the opinions of selected vocational agriculture teachers concerning the adequacy of their pre-service training in selected agricultural mechanics abilities, and to survey the importance which the vocational agriculture teachers had attached to their instruction in selected agricultural mechanics abilities.

The information for this study was obtained by mailing an opinionnaire to all vocational agriculture teachers in the State of Kansas who were teaching at the time of the study and who had received their B. S. Degrees at Kansas State University from 1960 through 1966. The opinionnaire contained 192 abilities in seventeen areas of agricultural mechanics. Respondents were asked to rate each ability in regard to quality of training as being "good," "fair," or "poor" and importance of training as being "very important," "important," or "not important."

Of the forty-five opinionnaires which were sent to the teachers of vocational agriculture, 100 per cent of the opinionnaires were returned. The data obtained from the forty-five returns revealed that all abilities in the following six agricultural mechanics areas were rated as "very important" by 50 per cent or more of the forty-five respondents: (1) training in all agricultural machinery, repair, adjustment, and servicing abilities, (2) training in all agricultural carpentry abilities with the exception of the

ability to "identify wood and lumber" and the ability to "construct complex project," (3) training in all agricultural electricity abilities with the exception of the ability to "select electric meter," (4) training in all concrete and masonry abilities with the exception of the ability to "lay brick," (5) training in all arc welding abilities with the exception of the ability to "install welder" and the ability to "solder," and (6) training in all oxy-acetylene welding abilities with the exception of the ability to "weld aluminum" and the ability to "solder."

There were fifty-five other abilities in seven other areas of agricultural mechanics which received "very important" ratings by 50 per cent or more of the forty-five respondents. The areas and number of abilities in each included: (1) three abilities in the area of forge and cold metal work, (2) six abilities in the area of tool fitting, (3) eight abilities in the area of soldering and sheet metal, (4) three abilities in the area of painting, (5) twenty-four abilities in the area of tractor maintenance, (6) six abilities in the area of farm power overhaul, and (7) five abilities in the area of irrigation and drainage.

An attempt also was made to survey the quality or adequacy of agricultural mechanics training at Kansas State University. Respondents were asked to rate the adequacy of their pre-service agricultural mechanics training in preparation for developing that particular ability in their



vocational agriculture students. The respondents rated only those abilities in which they had received training at Kansas State University.

The agricultural mechanics areas of (1) concrete and masonry, (2) arc welding, and (3) oxy-acetylene welding received the highest number of "good" quality of training ratings by 50 per cent or more of the respondents in comparing the number of abilities listed for each agricultural mechanics area and the number of "good" quality ratings for the abilities in each area.

The agricultural mechanics areas of (1) agricultural machinery repair, adjustment, and service, (2) painting, and (3) tool fitting received the least number of "good" quality of training ratings by 50 per cent or more of the respondents in areas which had abilities rated as "very important" by 50 per cent or more of the respondents.